

2013 UDOT RESEARCH PROBLEM STATEMENT

*** Problem statement deadline is March 25, 2013. Submit statements to Steve Bagley at sbagley@utah.gov ***

Problem Title: Route Advisory For Multi-Modal Routing and Emission Cost Estimation through TravelWise **No. : UT-13.06.07**

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Select a Subject Area

☐ Materials/Pavements

☐ Maintenance

☐ Traffic Mgmt/Safety

☐ Geotechnical

☐ Preconstruction

☒ Planning/Asset Mgmt

☐ Transportation Innovation

1. Describe the problem to be addressed.

TravelWise is a set of strategies developed by UDOT to encourage the traveling public to use alternative transportation modes (such as transit, walk and bike) to driving alone. The goals of the TravelWise program are to reduce energy consumption, optimize mobility, reduce traffic congestion and improve air quality. In order to achieve these goals, TravelWise aims to provide a coordinated transportation program to support alternative transportation modes, especially for converting short-distance driving alone trips to walk or bike trips.

The purpose of this research is to develop methodologies for multi-modal routing and emission cost estimation that can be implemented through TravelWise, to help enable effective transportation demand management and provide much needed information on emission costs and biking safety. Currently, emission cost estimation in standard planning practice is based on traveling distance only, not sensitive to prevailing traffic conditions, so additional methodologies are needed to include live traffic data. The current tools for route suggesting show traffic information on network and corridor levels, but not for the route level. Suggesting safe and reliable multi-modal routes is critical for encouraging mode switch and to reduce the overall emission impact of traveling activities.

This study proposes to review and evaluate available tools for route selection and analyzing regional emissions caused by transportation activities, and further provide recommendations on route selection and/or adaptation of traffic emission analysis tools.

2. Describe why this research is important and how it is unique.

This research will introduce the following approaches:

- (1) Development of a data hub, integrated with different data sources (from UDOT, UTA) and latest research results related to multi-modal route choice behavior.
- (2) Work with UDOT to enhance the data content and provide rich and relevant multi-modal information for TravelWise.
- (3) Provide emission cost estimates which are critical to enable effective traffic demand management strategies for attaining air quality standards.
- (4) Produce route-based emission curves as a function of travel speed
- (5) This research project is expected to help TravelWise to better understand and evaluate variant emission analysis tools toward their own modeling requirements.
- (6) The proposed research product will be a proof of concept, and will be hosted in a cloud computing facility (e.g. Microsoft Cloud Service) outside UDOT.

3. List the research objective(s) to be accomplished:

1. Work with UDOT and UTA to review available data sources on multi-modal routing advisory and transportation related emission cost estimation.
2. Develop criteria and procedures on evaluating dynamic routing engines and emission cost tools for transportation demand management applications.
3. Evaluate modeling methods and procedures for dynamic routing and quantifying emission impact of different transportation improvement strategies.
4. Recommend additional data needed for enabling accurate multi-modal routing provision and impact assessment for UDOT

4. List the major tasks to accomplish the research objective(s):

1. Review available tools on multi-modal routing and transportation related emission estimation. A wide variety of tools are available for emissions analysis. Generally, two categories of applications are used for transportation related emission estimation: transportation planning models and emission models. The transportation planning models analyze vehicle activities based on the traffic demands, supplies and management strategies, while the emission models examine the fuel consumption and greenhouse gas production from vehicles. This task will review variant tools on both categories and cross-compare their functionalities.
2. Meet with UDOT and UTA personal to specify detailed data and functional requirements for the required tools.
3. Develop evaluation criteria and procedures. A set of evaluation criteria will be developed to compare the performance of different routing algorithms with different data needs. An evaluation procedure will also be constructed to help agencies on making decisions on the selection of multimodal routing system design.
4. Discuss transportation improvement strategies on mode switches and emissions reduction, with the focus on multi-modal transportation.
5. Collect datasets in calibrating and validating dynamic routing and emissions analysis tools used in transportation planning applications.
6. Implement multi-modal routing and traffic emission analysis tools for UDOT. Write a draft report and final report.

5. List the deliverable(s) to come to UDOT from this research study:

1. Literature review on available dynamic routing engines with emphasis on multi-modal transportation, and emission cost analysis tools.
2. Proposed dynamic routing and emission cost estimation engines developed by the research team.
3. Methodology for integrating dynamic routing and emission cost estimation results within TravelWise.
4. Final report with all analysis, methodologies, tools and recommendations

6. Describe how the results of this study will be implemented at UDOT.

Multi-modal Route Advisory results can be used in the following ways:

- (1) Provide travelers with more transportation options that can avoid traffic jams and reduce commuting delays through mode, route and departure times changes.
- (2) Provide traffic operators with more information for route-level decision support.
- (3) Encourage both transportation system users and managers to make better informed decisions.
- (4) Focus on reducing short motorized trips (less than two miles)
- (5) Build up toward Transit Oriented Development (TOD) initiatives
- (6) Build up toward the overall goal in motorized trip reduction

7. Estimated cost - Total: \$100,000

UDOT Share: \$50,000

Other/Matching Funds: \$50,000

8. Outline the proposed schedule for this study, including estimated start date, duration, and major event dates.

Performance period for this project is 18 months, with an expected start on 07/01/2013 and end on 12/31/2014

Phase I (6 months): Literature review, data collection, tools evaluation

Phase II (6 months): Development and testing of Dynamic Route Advisory and emission cost estimation models

Phase III (6 months): Additional improvements and implementation of the models, and writing the final report